Table 1
Randomized Controlled Trials Evaluating the Effect of Tai Chi on Pain relief in Osteoarthritis

Author, yr Country	Mean Age	N	Tai Chi Dose/ Duration/style	Control	Pain	[a]Effect size (95% CI)
Hartman, 2000 USA	68	33	9-form Yang style 60 min 2x/wk for 12 weeks	Usual physical activity & routine care	AIMS	-0.77 (-1.48 to -0.05)
Song 2003 Korea	63	72	12-form Sun style 20 min 3x/wk for 12weeks	Routine treatment	WOMAC	- 0.66 (-1.28 to -0.05)
Brismee 2007 USA	70	41	24-form Yang style 40 min 3x/wk for 12 weeks	Attention control 40 min 3x/wk	VAS	-1.13 (-1..79 to -0.46)
Fransen, 2007 Australia	70	152	24 forms modified from Sun style 1hr, 2x/wk for 12 weeks	Waiting List	WOMAC	-0.40 (-0.89 to -0.08)
Fransen, 2007 Australia	70	152	24 forms modified from Sun style 1hr, 2x/wkfor 12 weeks	Hydrotherapy	WOMAC	0.09 (-0.37 to 0.54)
Lee 2009 Korea	69	44	Tai Chi Qigong 1hr, 2x/wk for 8 weeks	Waiting List	WOMAC	-0.56 (-1.20 to -0.08)
Wang 2009 USA	65	40	Classical Yang style 1hr, 2x/wkfor 12 weeks	Attention control (Stretching & wellness education)	WOMAC	-1.11 (-1.78 to -0.44)

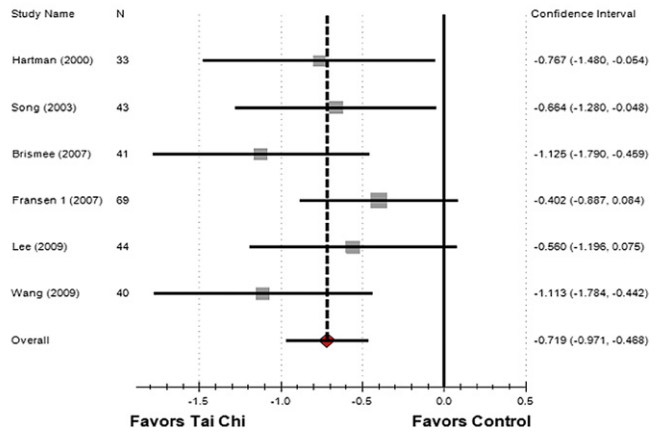
[a] Standardized Mean Difference for between group comparisons; N = number of included subjects; AIMS = Arthritis Impact Measure Scale; WOMAC = Western, Ontario and McMaster University Osteoarthritis Index; negative sign favors Tai Chi and positive sign favors control

included human randomized controlled trials of Tai Chi for KOA. The outcomes of interest were pain VAS or WOMAC. Study quality was assessed with Jadad criteria assessing randomization, blinding and dropout rates for each study. We computed effect sizes for pain as the standardized mean difference. The effect sizes were pooled using a random effects model. Heterogeneity was assessed using I^2 statistic.

Results: Our systematic literature search yielded 458 potential relevant studies. Six studies, published between 2000 and 2009, with 382 subjects (80% women) met our inclusion criteria (**Table 1**). The sample sizes varied between 33 and 152. The mean age was 68 years, and the treatment durations ranged from 8 to 12 weeks. The duration of OA ranged from 6 to 11 years. Three studies used the Yang style, two used the Sun style and one used the Qigong form of Tai Chi. We found a pooled effect size of -0.72 (95%CI -0.97, -0.47) favoring Tai Chi with a heterogeneity score (I^2) of 0% (Figure 1).

Conclusions: The results from this meta-analysis suggest that Tai Chi training may provide an ideal form of exercise for older individuals with symptomatic KOA. Further studies should be performed to replicate these results and deepen our understanding of this therapeutic modality.

Figure 1: Forest plot of Effect of Tai Chi on knee osteoarthritis



562
IMMEDIATE EFFECTS OF SHOE INSERTS ON PAIN DURING FUNCTIONAL TASKS IN INDIVIDUALS WITH PATELLOFEMORAL JOINT OSTEOARTHRITIS

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Purpose: Patellofemoral joint (PFJ) osteoarthritis (OA) is emerging as a distinct and common clinical entity associated with considerable pain, morbidity and impaired quality of life. The unique biomechanics of the PFJ mean that traditional interventions for tibiofemoral joint (TFJ) OA are unlikely to sufficiently address PFJ OA symptoms. Findings of a recent randomised clinical trial suggest that shoe inserts are effective for reducing PFJ pain in young adults. However, this simple intervention has not been investigated for PFJ OA. This study sought to i) determine the immediate effects of shoe inserts on pain during functional tasks in people with PFJ OA; and ii) investigate relationships between changes in pain with shoe inserts and demographics, symptoms, lower limb alignment, and insert comfort and support.

Methods: A within-subjects, repeated measures, randomised cross-over trial recruited individuals with PFJ OA (age $\geq$ 40 years; PFJ osteophytes on skyline radiographs; anterior knee pain during activities that load the PFJ e.g. steps or squatting, TFJ OA K&L grade $<$ 3). Demographics (age, height, weight), symptom severity (pain at rest and during activity on 10cm visual analogue scales (VAS); Knee Injury and Osteoarthritis Outcome Score (KOOS)), and static tibial and calcaneal alignment were recorded at baseline. Participants rated their pain on an 11-point numerical rating scale (0-10) while walking on level ground and while performing a step down task, under three test conditions applied in a random order: i) running sandals (Nike Strap Runner); ii) sandals with prefabricated foot orthoses (Vasyli International); and iii) sandals with flat EVA insert. After completion of each test condition, they rated the comfort and support of the shoe, orthoses or flat inserts (VAS). Repeated measures analysis of variance and post hoc tests of simple effects examined differences in pain between the three conditions for each functional task. Pearson correlations investigated relationships between changes in pain that occurred with orthoses and flat inserts (compared to shoes alone), and demographic, symptom, alignment, and comfort and support ratings, for walking and step-downs. Significance was set at 0.05.

Results: 23 participants completed the study (12 males; age 53±9; baseline pain with walking 2.4±2.1cm, going down stairs 5.2±2.5cm). There were significant main effects for both walking (p=0.041) and the step down task (p=0.005). Pairwise comparisons revealed that, compared to shoes alone, significant reductions in pain occurred for both orthoses (walking: mean difference -0.78, 95% CI -1.46 to -0.11; step down: -1.28, -2.13 to -0.43) and flat inserts (walking: -0.83, -1.46 to -0.2; step down -1.35, -2.15 to -0.55). There were no significant differences between the two inserts for either task. Greater body weight was associated with less improvement on stairs with orthoses (Pearson correlation coefficient -0.59, p=0.003) and flat inserts (-0.52, p=0.011). Older age was associated with greater improvement with orthoses during walking (0.51, p=0.018).

Conclusions: Study outcomes indicate that shoe inserts, be it prefabricated foot orthoses or flat EVA inserts, can produce immediate and significant reductions in perceived pain during activities that typically aggravate symptoms associated with PFJ OA, irrespective of baseline symptoms and lower limb alignment. Furthermore, the magnitude of the change in pain may represent a clinically meaningful effect. This indicates that shoe inserts are likely to be an effective intervention for PFJ OA, and warrant further investigation using randomised clinical trials to determine longer-term effects. Findings that those with lower body weight experience greater improvements in pain during a task that maximally loads the PFJ suggest that greater success may be achieved by targeting particular individuals, or combining shoe inserts with a weight management program.